



INSTALLATION MANUAL Talon2 Grid-Tied

Featuring

**VARIABLE
PITCH** technology



Rev. 2.1.0



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Prior to installation and operation, it is important that you thoroughly read this manual to ensure proper performance and safety.

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Statement

A&C Green Energy is not responsible for any damage and/or injury caused under the following situations:

- * Damage caused by any incorrect installation
- * Damage caused by using unauthorized equipment
- * Damage caused by any incorrect operation
- * Damage caused by lightning, typhoon and other force majeure

Note:

1. The off-grid installation manual is available on line at www.acgreenenergy.com or call A & C Green Energy, Inc.
2. To install the system correctly, sometimes a certified structural engineer and licensed electrician is necessary.
3. The annual power output from the system is determined by the local wind resources and some other factors, such as the installation elevation, temperature, system conditions, terrain and density of periphery buildings.

1. General

1.1 Marking Illustrations

Each sign below has its special meanings. It is mandatory for the installers and users to understand their meanings and act accordingly. Contact us if you need help.



Warning: means there are risks that may cause personal injury or even death.



Caution: means there are risks that may cause wind turbine, equipment or property damage.



Advice: helpful installation & maintenance hints from the manufacturer.

2. Wind Generator Basics

2.1 Grid-Tied Systems and Off-Grid Systems

- Off-grid application: The electricity generated by the wind turbine can be stored into batteries. Through an off-grid inverter, the DC electricity can be changed into stable AC electricity for off-grid power supply.
- On-grid application: The electricity generated by the wind turbine can be rectified into DC electricity. Through an on-grid inverter, the DC can be converted into stable AC and feed the local utility grid.

2.2 Up wind Systems and Down Wind Systems

The terms **Upwind** and **Downwind** refer to the relation of the turbine blades to the pole. An upwind turbine orients the blades on the upwind side of the pole and vice-versa. An upwind turbine can have a tail or no tail. A downwind system has no tail. The blades naturally maintain their orientation on the downwind side of the pole no matter which direction the wind blows.

2.3 Fixed Pitch systems and Variable Pitch Systems

- **What is Variable Pitch Technology?** This is an advanced method of regulating the rotor RPM by adjusting the blade's attack angles based on the RPM. When the

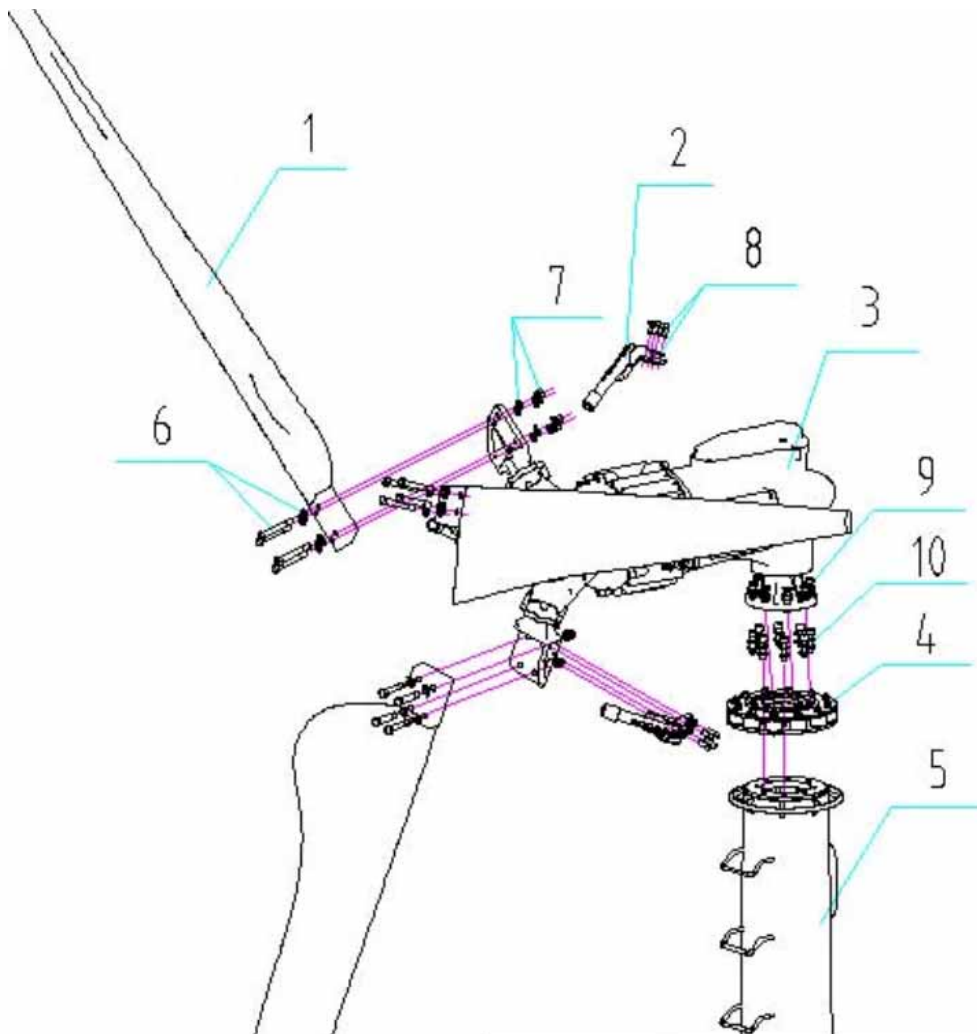
RPM goes higher, the attack angle will decrease so the rotor slows down. This system enables the wind turbine to maintain a constant peak output during times of high wind.

- **How does TALON Variable Pitch Technology work?** The principle is using centrifugal force to make the blade rotate along its axis. Each of the Talon's 3 blades has an attached centrifugal hammer which acts when the generator reaches the rated RPM and causes the blade to rotate along its axis to reduce the attack angle. .
- **Why is Variable Pitch Technology important?** The variable pitch system produces more energy than other systems simply because it will not shut down when the rated wind speed is reached as other wind turbines do. When the wind speed reaches 25mph, other systems begin to shut down. However, a variable pitch system keeps generating energy at the peak rate. This makes a significant difference in the total power generated.
- **What does all this mean?** With the increased power output from the Talon wind turbine, you will have more energy to use and more energy bill savings. The better technology means a higher return on your investment.

3. TALON – The Downwind Variable Pitch System

3.1 Structure

This turbine is composed of variable pitch blades, permanent magnet generator, tower, E-Load box, mechanical braking system, inverter etc.



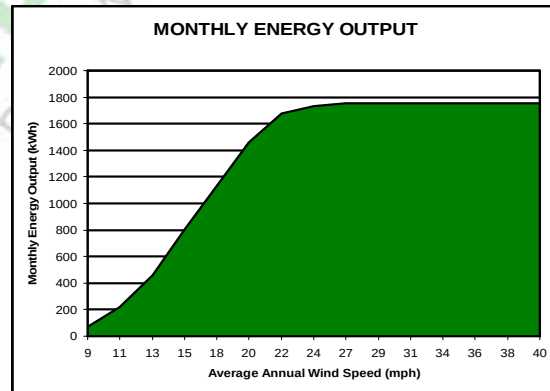
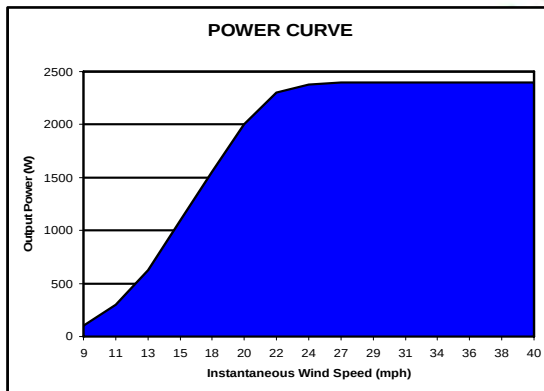
No.	Part name
1	blade
2	Centrifugal hammer
3	Wind turbine body
4	Shock absorber
5	Tower
6	Outer-hexagonal bolt M16*110
7	Inner hexagonal bolt M16
8	Inner hexagonal bolt M10*30
9	Outer-hexagonal bolt M16*55
10	Inner hexagonal bolt M16*55

3.2 Technical Specifications

TECHNICAL SPECIFICATIONS

Blade Diameter	13.1 feet
Blade Material/Quantity	FRP/3
Rated Power	2,000 W
Peak Power	2400 W
Rated Wind Speed	20 mph
Start-Up Wind	5.6 mph
Working speed	9-56 mph
Survival Wind	112 mph
Rated RPM	360 rpm
Generator Type	3 phase PMG
Speed Regulation	Variable Pitch Technology
Shut Down Method	Manual or Auto Shutdown
Generator Lifespan	15 years

3.3. Output Power and Performance Curves



Wind Speed (m/s)	4	5	6	7	8	9	10	11	12	13	14	15	16
Wind Speed (mph)	9	11	13	15	18	20	22	24	27	29	31	33	36
Output Power (W)	100	300	625	1100	1550	2000	2300	2375	2400	2400	2400	2400	2400
kWh	73	219	457	804	1132	1461	1680	1735	1753	1753	1753	1753	1753

3.4 Features

3.4.1 Blades

With a high tip-speed ratio and a noise lower than 65db, the blades have been aerodynamically optimized for better performance. The blades have passed extensive wind tunnel tests. The co-efficiency of the blades is over 0.4.

Made of the same material as the mega-watt wind generator systems, the special purpose gel-coat resin and reinforced FRP, each Talon blade set is highly durable and will guarantee safe operation under a wind speed of up to 56mph wind speed.

3.4.2 Generator

Features rare earth magnets, high temperature, enamel-coated magnet wire and top grade bearings, which make the generator's efficiency greater than 90%. The generator reaches F-Grade insulation and IP54 protection standard, and is designed as maintenance free during its life time. The cast steel housing is galvanized and powder coated for long lasting life and harsh environment.

3.4.3 Speed Regulation-Self Adaptive Variable Pitch Technology

All wind systems adopt some type of speed regulation method to avoid self-destruction. The megawatt systems pitch their blades to maximize the power output using automatic control systems. Most small wind systems use either tail furling or an electronic brake to control the RPM. However, both of these methods will significantly reduce the power output since they shut down the system at its rated RPM. The electronic brake may also cause the generator and electronics to burn out during extended high winds.

TALON systems use centrifugal force to adjust the pitch angle of the three blades to regulate the RPM. It is a self adaptive process. When the rotor is static, the pitch angle is about 10 degrees. As the RPMs go higher, the centrifugal force becomes greater and starts to push the blades to reduce the pitch angle to slow down the rotor. On the contrary, when the wind slows down, the pitch angle increases to help raise the RPM. At about the rated wind speed, the system will reach a balance so the RPM begins to wave around the rated value until wind speed reaches 56mph. Therefore, the power generated will be significantly higher than the other speed regulation methods since the working range is much larger.

The Fig. 2 shows how this passive centrifugal variable pitch technology works.

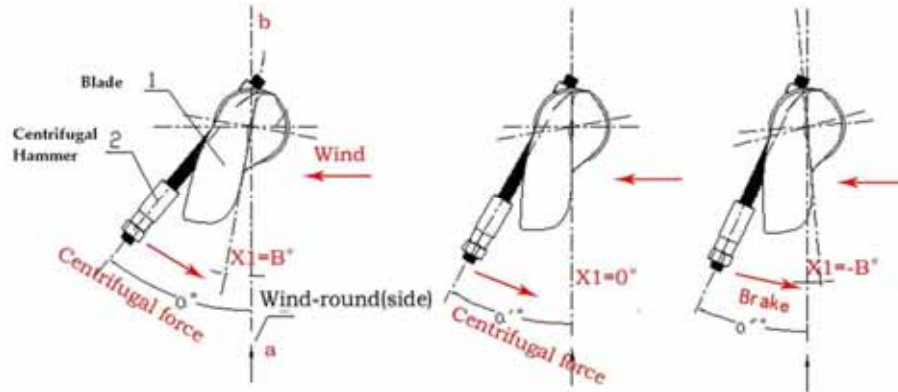


Fig. 2

When the wind speed is below 7 mph (3m/s), the turbine blade angle remains static and the angle ($X1$) formed between the blade and turbine plane is B° ($X1=B^\circ$). This is the ideal angle for the blades to begin their rotation. As long as the wind speed reaches 7 mph, the blades will begin to rotate. While rotating, the outermost edge of the blade will be driven by the centrifugal force generated by the rotation of the blade to tilt toward the turbine plane. As the wind speed increases, the blade angle ($X1$) will then decrease to 0° so that the blade is parallel with the turbine plane. At this angle, the turbine has nearly reached its rated output power. When the wind speed is between 20 mph - 55 mph (9m/s - 25m/s), the blade angle ($X1$) will stay near 0° with slight fluctuations in order to maintain its rated power. When the wind speed is between 55 mph - 112 mph (25m/s - 50m/s), the wind will draw the blade by the centrifugal force, so the angle ($X1$) will continue to decrease to a negative angle ($X1 = -B^\circ$) [B° and $-B^\circ$ are not the same]. Under this negative angle, the blade angle will produce a resistance on the rotation of turbine blades to slow down the turbine, thus protecting it from over-speed operation. The maximum revolution of the turbine will be no more than 370 RPM. For the 2KW system, the $B=10$ and $-B=-7$ to -8 degree.



3.4.4 Other Features

The TALON adopts a downwind system design, which eliminates the tail. All the parts are galvanized and powder coated so they can last for years without rusting.

4. Safety Measurements

- Do not allow the TALON to run without a load. A no-load condition may cause damage to generator itself or the blades.
- Avoid allowing the system to run under high wind speed (≥ 56 mph) for an extended period of time. It is recommended (though not required) to shut down

the wind turbine manually when the wind speed is over 56mph to protect the wind generator.

- Do not turn the electronic brake on when the RPM is high. Turn the brake on when the rotor slows down.
- Before disconnecting the E-Load Box from the generator, set the brake manually by pulling down and locking the winch (lever). After disconnecting the E-Load box from the generator, short circuit the 3 wires from the generator.
- Do not stand under running wind turbines during high winds.
- If there is an unprecedented vibration or strange noise being detected during the turbine operation, stop TALON immediately for inspection.
- When setting up the TALON, be sure to set the brake and that the 3 wires from the generator are short circuited until all the electronics are connected. When disassembling the TALON, please put the generator on brake and short circuit the 3 wires from the generator, then disconnect the electronics. (See appendix 3)
- All electrical connections should strictly follow the NEC code. All electrical equipment and the generator pole need to be properly grounded according to NEC code.

5. Installation

5.1 Preparation

1. Check the parts against the packing list. If you encounter any packaging discrepancies, contact your Talon reseller immediately.
2. Keep all the parts and components away from water.
3. Prepare electrical cables based on the table in Appendix 4. Since the transport loss of AC is greater than DC's, we recommend the E-Load Box be installed within 660 feet from the generator. If the distance is greater, please choose a thicker wire based on the table in Appendix 4.
4. The turbine should be installed when the wind speed is less than 18 mph.

5.2 Making the Foundation

Notes: the foundation varies based on the soil conditions and location. The technical drawing in Appendix 2 only applies to an 8 meter tower on the soil conditions specified and a non-flooded area. Please contact A&C Green Energy, Inc for availability of technical drawings for your location or consult a local certified structural engineering firm for the appropriate foundation design.

1. Dig a 2.64'×2.64' square hole that is 6.6' deep
2. Make a rebar grid as shown in appendix 3. The quality of this grid is crucial to the strength of the tower base. Fix the bottom and top positioning plates onto the grid. Set the 8 anchor bolts through the 8 holes of the bottom and top positioning plates. Adjust the alignment to make sure the 8 anchor bolts are perpendicular to the positioning plates.
3. Put a 4" layer of concrete at the bottom of the hole and make it level.
4. Make a frame with inner dimensions of 2.64'X2.64' using two layers of wood boards. Place the frame around the pit and set the rebar grid in the center of the pit. Make sure the positioning plates are level.
5. Make a 90 degree conduit and fix it onto the rebar grid. One end of the conduit should be at the center of the top positioning plate with 0.5-1" above the projected concrete surface. The other end should come out of the side of the pit and be connected to the conduit in the ditch. Cover the conduit opening with duct tape.
6. Pour the concrete.
7. Wait at least 100 hours to allow the concrete to cure. During this period do not touch it or attempt to install the wind turbine.
8. After the concrete has cured, remove the wood frame and fill the side of the concrete with soil and stone. Tamp it tight.

5.3 Tower Assembly



1. Bolt the upper and lower tower sections together. Make sure the markings on the tower sections are aligned.
2. Place the connected tower with the tower bottom close to the foundation; put a bracket beneath the tower 1 ½ feet away from the tower top.
3. Using a steel wire, insert the electrical cable (3 leads) and the steel cable into the tower top and pull them out from bottom of the tower. Leave 18 inches outside the tower top.

5.4 Generator Installation

5.4.1 Generator Body Installation

1. Securely connect the 3 electrical cables to the 3 wires coming out of the generator and insulate the connections. Connect the steel cable to the pulling rod which connects to the variable pitch system. Short circuit the 3 electrical cables so the generator will not spin during the installation.
2. Bolt the vibration isolator onto the tower top by aligning the flange holes of the vibration isolator with the flange hole of the tower top. Tighten up the eight M16×70 inner hexagonal bolts (including the spring washer and flat washer).
3. Lift the wind turbine to align the bottom flange with the vibration isolator flange, bolt them up with eight M16×70 inner hexagonal bolts.



Fig.2



Fig.3

5.4.2 Blade Installation

1. Lift the generator body, which has been connected to the tower with the hub facing sides or down. (figs 4 and fig 5)
2. Fix the three blades onto the hub with 12 M16X110 hexagon bolts. Please make sure the letters on the blades match the letters on the hub. Be sure to use flat washers, lock washers and nuts. The torque of the bolts must be 180~210Nm.



Fig 4



Fig 5



Short circuit the 3 leads of the electrical cables to prevent the rotor from spinning.

5.4.3 Centrifugal Hammer Installation

Hold the centrifugal hammer downward and fix it onto the blade hub one by one. Please refer to Fig. 8 for the correct positioning of the hammers. The four M12×20 hexagon bolts and spring washers are to be used for each hammer. (Fig. 6, Fig. 7 and Fig. 8)



⚠ WARNING

The inappropriate installation of the centrifugal hammers will cause the variable pitch failure, which will damage the system and may cause personal injuries.

5.4.4 Manual Shutdown System Installation

The mechanism of shutting down the TALON wind generator is implemented by adjusting the blade pitch angle so that the rotor loses propelling power from the wind.

The manual shutdown system includes a winch, the steel cable and the variable pitch blades. When the winch is applied, the cable pulls the blades to rotate along their axis to have a smaller attack angle so the rotor stops. When the winch is released, the spring pushes the blades back to their original orientation so the rotor can start rotating.

5.5.4.1 Installation

Install the winch at the tower bottom with the provided bolts. Connect it with the steel cable from the turbine body. (Fig. 9 and Fig. 10)

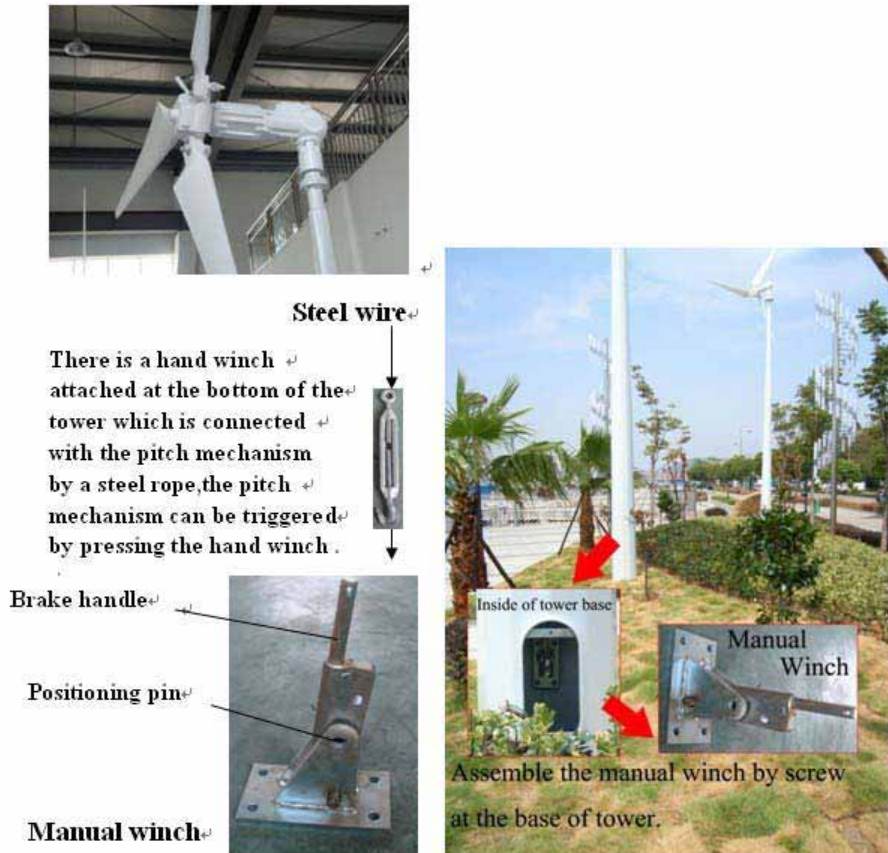


Fig.9

Fig.10

When installing the winch, adjust the cable tightness so that when it's applied, the blades will pitch to the largest angle allowed.

5.4.4.1 Inspection of the Blade Pitch and Braking Mechanism

The purpose of this step is to verify the blade pitch can be adjusted when the winch is tightened so the turbine will stop rotating, and when the winch is released, the blades return to the normal pitch angle so the rotor spins.

1. Check the tightness of the steel cable. When the winch is not applied, the steel cable is loose and the blades pitched at about $B=10$ degrees to catch the wind. When the winch is applied, the steel cable is tightened up and the blade pitch becomes $B=-7$ to -8 degrees with the rotation plane. See Fig. 2.
2. Manually tighten up and release the steel cable 2 or 3 times, verify the blade pitch angle changes accordingly. Make sure the winch can be held at the stop position with the positioning bolt.



This step should be completed before the tower is erected.

5.5 Erecting the TALON

5.5.1 Inspection before Erecting the TALON

The inspection is an ongoing process which should be done during the installation to make sure each part is installed correctly and securely. Before erecting the tower, inspect all the parts installed on the top of the tower. The following is a list of items to be checked:

1. Check to make sure the blades are fastened securely to the hub. Make sure all the nuts are tightened up with the right torque. Make sure the distances between the blade tips are equal.
2. Check to make sure the centrifugal hammers are securely installed. Make sure all the nuts are tightened up with the right torque. Verify with Fig. 8 to make sure the direction of the hammers is correct.
3. Verify the initial attacking angle is about 10 degrees and the stopping angle is about -7 to -8 degrees. When the winch is not applied, the steel cable should be loose and the blades will pitch about $B=10$ degrees to catch the wind. When the winch is applied, the steel cable is tightened up and the blade pitch becomes $B=-7$ to -8 degrees in relation to the rotation plane. See Fig. 2.
4. Manually apply the winch 2 to 3 times. Verify the blade pitch angle changes accordingly. Make sure the winch can be held at the stop position with the positioning bolt. Apply the winch at the end of the testing.
5. With the 3 output wires open, turn the rotor manually to make sure the generator can rotate freely. Be sure to short circuit the three wires after this testing.

WARNING

Steps 3 and 4 are very important and must be performed precisely. The purpose is to test if the blade pitch can be adjusted when the winch is applied so the turbine will stop rotation; and when the winch is released, the blades return to the normal pitch angle so the turbine spins.

ADVICE

These testing steps should be completed before the tower is erected.

5.5.2 Erecting TALON with a Crane

1. Put 8 nuts onto the 8 anchor bolts before lifting the tower. Screw these nuts down to leave enough space for the tower flange, the washers and nuts which will be on top of the flange. (Fig. 13)
2. Securely wrap a strong and flexible textile belt to the generator and lift it up with a crane. When the tower base leaves the ground, align it to the anchor bolts so the tower flange will fit into the 8 anchor bolts. Put on the flat washers and lock washers on the anchor bolts and screw the nuts onto the anchor bolts loosely. (Fig 12, Fig. 13 and Fig. 14)
3. Choose two pair of anchor bolts which form a cross. Loose all the nuts on the other anchor bolts both on top of flange and beneath the flange. Adjust the four nuts beneath the flange to make the tower level then tighten up both the upper and lower nuts simultaneously. After the tower is leveled, tighten up all the other nuts in the diagonal order. (See figs 12, 13, 14)

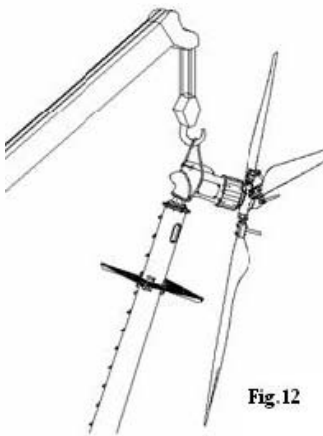


Fig.12



Fig.14



Fig.13



Make sure the winch is applied and the 3 wires are short circuited during the installation.

When the tower is lifted and about to leave the ground, the tower may swing and hit the base or anchor bolts. To prevent damage, position the crane so that the tower base has enough clearance from the base when it's lifted.

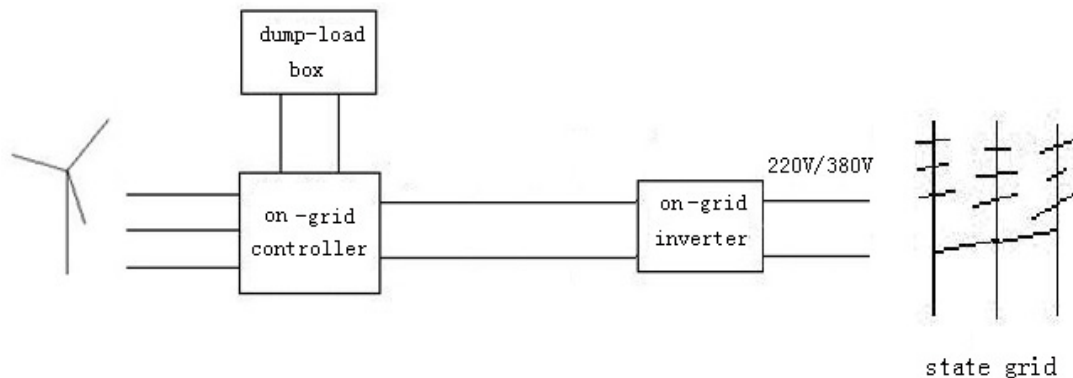
When the tower is lifted above the ground, the generator and tower may rotate horizontally and cause the blades to hit the crane arm. Please make sure the crane arm has enough clearance from the generator blades or have a person hold on the pole so it will not spin.

5.5.3 Inspection of the Tower

1. After the tower is erected, make sure all the nuts are tightened up to the torque specified.
2. Observe the generator to make sure it can rotate horizontally with the changes of the wind direction. If there is no wind, climb up to the tower and manually rotate the generator to test if the generator stops at random spot. If the generator always stops at the same position, please readjust the nuts to make the tower straight and continue testing until the tower is level.

6. Electrical Wiring

6.1 System Diagram



On-grid system diagram

Fig. 16

The diagram for the grid-tied turbine system is shown in Fig. 16. The corresponding wiring diagram is showed in appendix 3. The system consists of the wind turbine, E-load box (with dump load inside), UL1741 compliant grid-tied inverter and the grid. The wild AC generated by turbine is converted to DC by E-Load box, which in turn is fed into the inverter. The inverter synchronizes itself with the grid and puts out the AC power with the same voltage and cycles as the grid. The generated electricity is automatically consumed by the appliances or makes the utility meter go backward.

6.2. Electronic Equipments Settings

To have proper ventilation and easy connection of the cables, please refer to the manuals for proper clearance around the electronic equipments.

For the E-Load box settings, please keep 8 inch clearance on the top, and 8 inch clearance on the right. 4 inch on the left and bottom.

For the inverter settings, please keep 6 inch clearance on top and right sides, 8 inch clearance below and 2 inch clearance on the left. Refer to page 19 of the installation manual for details.

6.3 Wiring Procedures

1. Refer to the E-Load and inverter manuals to connect the E-Load and inverter together.
2. Set the brake on the side of the E-Load box to manual brake, and connect the 3 wires of the wind generator to the E-Load box. This brake actually short circuits the 3 wires of the generator together.
3. The dump load is already installed in the E-Load.
4. The output of the E-Load should be connected to the DC input of the inverter via a fuse or a breaker suggested by the inverter. Make sure the polarity is connected correctly when making this connection.
5. Refer to the inverter manual to connect the inverter with the grid. Make sure the connection meets the grid voltage.



Please refer to the E-Load box and inverter manual to choose the right circuit breakers and fuses.

7. Computer Monitoring System

A computer can be hooked up with the inverter to pull the real time data out of the inverter and display it on the screen. It can also pull the history data for analysis. The monitoring software is free and comes with the inverter. User needs to provide his own computer.

7.1 System Requirements

The monitoring software needs to run on a windows-based computer system with a USB connection. These are minimum hardware requirements:

CPU: 2GHz

RAM: 512 MB

USB Port

Operating System: Windows 2000, Windows XP or Windows Vista

7.2 Features of the Monitoring System

1. Multiple language support. You can choose to use English, Spanish, French, Italian and German.
2. Multiple inverter support. One computer can monitor multiple inverters.
3. Warning and Error Logs.
4. Configurable sampling time interval.
5. Date / Time Synchronization between computer and inverters.

7.3 Real Time Data Logging and Displaying

The system collects and displays the energy harvested and the system status. The data can be displayed in multiple ways of your choice. You can choose to

1. Show the real time voltage and power output of each inverter.
2. Show the real time power and energy generated.
3. Show the statistics as bar chart using the history data by days, weeks, months, years and life span
4. Review and download alarms and warnings reported by inverter

7.4 Screen Shots

The screen shot in Fig. 17 shows the real time power and the energy generated by the system.

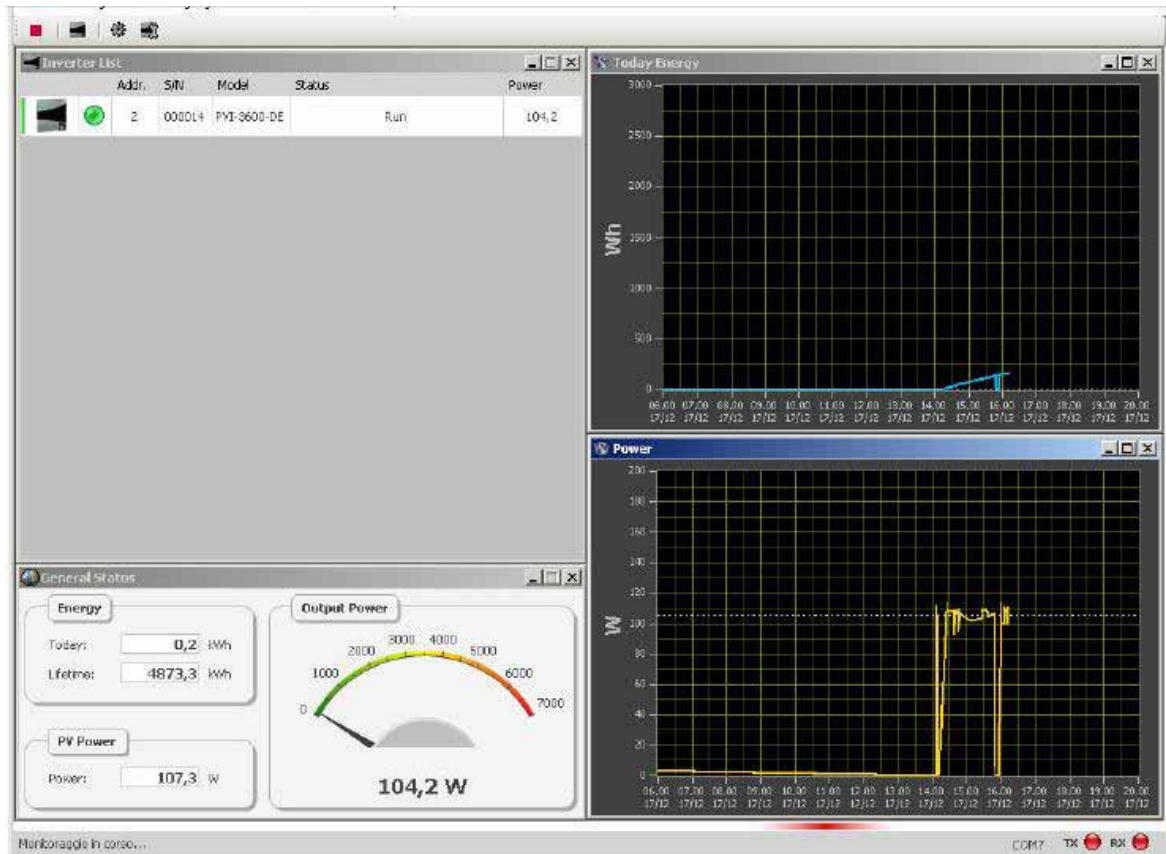


Fig. 17

The screen shot of Fig. 18 is the output power and the status of the system.

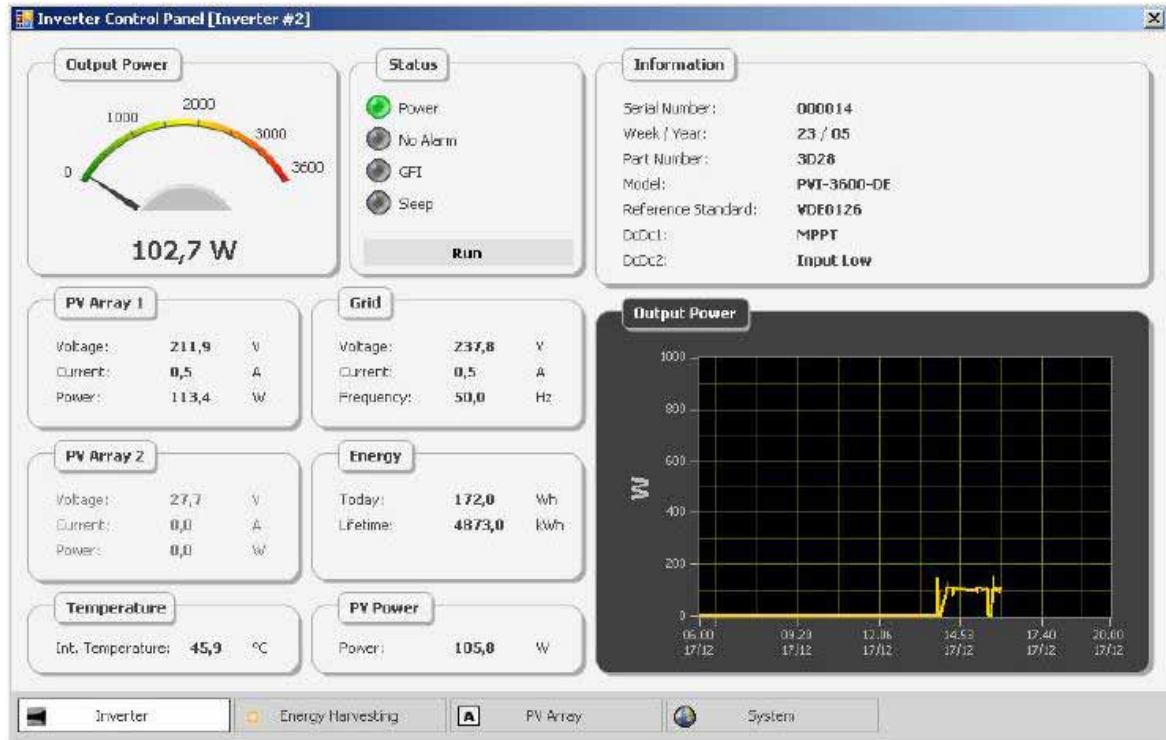


Fig. 18

8. System Testing

8.1 Inspection of the Electrical Wiring

It's very important to perform an inspection before starting the system testing since mistakes may cause equipment damage or personal injury.

1. Check the E-Load box to make sure it is connected correctly. The 3 wires of the generator outputs should connect to the wind inputs of the E-Load box. The DC outputs of the E-Load box are connected to the inverter's inputs. Make sure the polarity is connected correctly between the E-Load and inverter.
2. Make sure the DC breaker and fuse are installed and to the specs of the inverter manual.
3. Check the output connection of the inverter to make sure it produces the same voltage as the grid power. Please contact A&C Green Energy Inc. for tech support or consult a certified electrician for help.

4. Check if the system is grounded properly. Use the NEC code for the grounding specification. Make sure the controller, inverter and the generator tower are all grounded.

8.5 System Testing

Because of the variations of the wind resource, a thorough testing of the system may take several months to complete. Therefore, before the system is handed over to the customer for operation, we recommend the following basic tests be performed.

8.5.1 Basic Testing

To perform the following basic tests, you need to have at least 10mph wind speed.

1. The turbine should be static before this test.
2. Start the turbine by turning off the brake on the side of the E-Load box and releasing the pitch brake.

The turbine starts to rotate when the wind speed reaches 9 mph. The starting wind speed is slightly higher during the first several startups, but it will become normal after the break in period.

Set the multi-meter to AC mode and check to verify the line-line AC voltages of the 3 output leads of the generator are identical. Change the multi-meter to DC mode and check to observe if the output DC voltage of the controller increases when the rotor speeds up. When the DC voltage reaches about 202 volts at about 10 mph wind speed the inverter should start working, the LED should light up, and the power should start to feed into the grid.

3. With the generator rotating, manually apply the winch and observe if the generator gradually stops and starts when the winch is released.
4. Cut off the grid power and verify the inverter stops putting out electricity (UL 1741 compliance). If you have added the automatic disconnect mechanism, verify the controller/power box is disconnected from the inverter at this moment.
5. If any of the above testing fails, stop the generator by applying the winch and/or electromagnetic brake and go to the trouble shooting procedures.
6. If the turbine has passed the above testing, it is ready to hand over to customer for normal operation.

8.5.2 Advanced Testing

The advanced testing is not mandatory, but we recommend it be done whenever the wind resource is available. In case it cannot be performed right away, we advise the user to observe the system behavior whenever a high wind situation is available and communicate with installer about the system behavior and report any abnormal situations.

To perform this test, you need to have over 23mph wind speed.

1. When the wind speed reaches 23mph, the blade pitch begins to change. This can be observed by monitoring the line-line AC voltage. The voltage should begin to go up and down instead of keeping going up.
2. Check the output power by multiplying the voltage and current. The peak output power of the E-Load box should not exceed 5.8 KW. The E-Load's output power can be obtained by multiplying the DC voltage and the current of E-Load's output.

9. User's Manual

The TALON turbine system should be put into service ONLY after it has passed the basic testing in the installation manual. The TALON turbine should be serviced ONLY by authorized personnel. Call A&C Green Energy Inc or your TALON reseller should you need help.

9.1 How to Shutdown and Start the System

9.1.1 The System Start Procedure

No matter if it's the first time you start the system or following a system shutdown, always start the system in to the following order: Inverter>E-Load Box> Generator.

1. If this is the first time the system is to be started, make sure all the equipment is connected correctly. Make sure the inverter is connected to both the grid and the E-Load. Turn off the electromagnetic brake on the side of the E-Load box and then release the winch to start the generator.
2. If the system was shutdown for maintenance, please make sure the maintenance is complete and all the connections are restored correctly before starting the system. Make sure the inverter is connected to both grid and the E-Load, release the electromagnetic brake on the side of E-Load box, and then release the winch to start the generator.
3. If the system was shut down automatically, please make sure the reasons which caused the system to shut down no longer exist before starting. Press the start button to restart the system.

9.1.2 Manual Shutdown Procedures

For maintenance or avoiding high wind damage to the system, the turbine should be shut down manually by cranking down the winch. After the winch is applied, the turbine blade pitch becomes zero degree and the turbine will stop rotating.

In case this shut down procedure fails, manually turn on the electromagnetic brake on the side of the E-Load box. This should be used only when the rotor spins slowly or used as an emergency stop.

9.1.3 Automatic Shutdown (optional)

This mechanism is not included in the standard configuration but can be ordered separately. The E-Load box keeps testing the generator output voltage and the operational duration of the dump load to see if either is out of the range. If either of the two exceeds the normal range, the E-Load will send the shut down signal and the blade pitch will change to zero degree and slow down the rotor until it stops.



Whenever there is a need to turn off any equipment along the power chain: the generator, the E-Load and the inverter, always turn off the generator first, then the E-Load and then the inverter. But whenever it's ready to be started, do it in the reverse order, i.e. start the inverter first, then E-Load and then generator.

9.2 User Routine Check

The following routine check can be done by the users each week.

1. If there is abnormal vibration or noise, shut down the turbine for further inspections.
2. Check if the blades pitch change smoothly when the wind speed is over rated speed.
3. If the generator does not go with the wind direction, the tower level needs to be adjusted.
4. Observe the blades with a pair of binoculars for any damages which may cause the system out of balance. Also check if the blades need to be cleaned because of dirt or bugs, which may reduce system efficiency.
5. Check and Make sure the dumping load of the E-Load Box works well when the wind speed approaches the rated wind speed.

9.3 Maintenance

9.3.1 Maintenance after First 1,000 Hours

1. Check all nuts and bolts, and tighten them up in accordance to the torque defined in Appendix 1. Check the tightness of the following bolts and nuts:
 - The tower foundation and the anchor bolts and nuts
 - The bolts and nuts which connect the towers together
 - The bolts and nuts which connect the generator to the tower.
 - The Rotor hub nuts
 - The Blade bolts and nuts
 - The Bolts between the generator and nacelle
 - The round nut on the vertical shaft bearing
2. Check the welding of the tower rod to ensure that there are no cracks or flaws. Checking emphasis is as follows:
 - root part
 - connection flanges
 - tower top flange
 - rotor hub
3. Check the steel cable. Replace if damaged.
4. Check the Generator Output Cable
 - Check to see if the three power output cables are firmly fixed inside the nacelle, or if the sheath has been damaged.
 - Check if the 3 wires have been connected firmly with the brushes and they have a good electric contact.
 - Check if the electric brushes have a good contact with the slip rings. Observe if there is any over heat damage.
 - Check if the three phase voltages of the generator output are balanced.
5. Clean and Lubricate the Motion Mechanical Parts
 - Open the nacelle window, cleaning the spine shaft and lubricate it.
 - Open the nose cone, cleaning the joint bearing and lubricate it.

9.3.2 Checking After Heavy Winds

After strong wind (>56mph), repeat those checks in 9.3.1 and 9.3.2 again.

9.3.3 Maintenance every 3,000 hours

1. Repeat every check and maintenance process detailed in section 9.3.1-9.3.2.
2. Check the conditions of the rotor.
 - Checking the contour of the blades, especially the tips and front edges, to see whether there are any cracks, damages or sign of unusual wear.
 - Check the blades to see if there is any deformation which may result in unbalance, transit or pitch angle inconsistency between 3 blades.
3. Clean up the slip rings and the electric brushes. Polish the conduct surfaces. Any worn electric brush should be replaced. The contact area between the brush and slip ring should reach 95% or more.

9.3.4 Yearly Maintenance

1. Lubricate the blade hub, joint bearing and spine hub every year.
2. The spring position inside the rotary body should be checked every year, replacing any damaged springs.

10. Troubleshooting

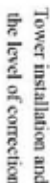
Problem	Possible Reasons	Possible Solutions
Excess Vibration	1. Pull rope of steel wire is loosen. 2. Blade fixing bolts are loosen. 3. Blade is defective caused by external force. 4. Blade lost balance because of the ice accumulation on the blade.	1. Tighten the steel wire rope appropriately. 2. Tighten the loosen parts. 3. Replace a new one and adjust the blade balance. 4. Remove the ice.
Turbine Head won't track the wind and pivoting is hindered.	1. There is too much oil sludge and dirt in the vertical shaft and bearing. 2. Rotating part is deformed by external force. 3. There is little or even no gap between vertical shaft and sleeve.	1. Clean and remove the dirt, lubricate it. 2. Recover and correct the deformation. 3. Repair it to meet the requirement.
Abnormal Noise	1. Fixed parts are loose. 2. Generator bearing is loose from its seat. 3. Generator bearing is damaged. - Wind rotor is rubbing with another part.	1. Lower turbine and tighten loose parts. 2. Detect and repair the loose part. 3. Replace the damaged bearing. 4. Detect and eliminate the trouble.
The rotation speed of the rotor is reduced noticeably.	1. Variable Pitch system is ineffective. 2. Stator winding is short-circuited or output circuit is short-pass. 3. Brake disk is rubbing. 4. Switch is set at "close" position.	1. Check and eliminate the trouble. Lubrication and maintenance. 2. Detect the short-circuit, split the lines and isolate them. 3. Readjust the brake gap. 4. Set switch to "open".
The output voltage of the generator is low.	1. Rotation of the generator is too low. 2. Permanent magnet rotor has lost its magnet. 3. The conductivity of connect point between slip ring and output circuit is weak. 4. There is a short circuit in the rectifier. 5. Circuit line of low voltage electricity transmit is too long, or the diameter of wire is too thin.	1. Upon detection, restore to normal rotation (rpm). 2. Change magnet or generator rotor. 3. Clean slip ring and contact point to reduce resistance. 4. Replace this equipment. 5. Shorten the circuit line or decrease the diameter of the wires to reduce electricity loss.
There is no output electric current in the AC circuit of the generator.	1. There is a circuit break in the AC lines of the generator. 2. Fuse is blown. 3. Stator winding is burnt, circuit is broken.	1. Detect and reconnect the wires. 2. Replace the fuse. 3. Disassemble, repair, recover.
AC output is normal, but there is no DC output current.	1. DC fuse is blown. 2. Output circuit is broken. 3. Rectifier is damaged.	1. Replace the fuse. 2. Detect the breaking point and reconnect the wires. 3. Replace this equipment.
Output capacity of the batteries is insufficient.	1. Output voltage of the generator is too low, or no electricity is being generated at all. 2. The connector of the battery is corroded by acid, resulting in weak conductivity. 3. Battery failure.	1. Check and eliminate the trouble. 2. Clean the connectors. Tighten and coat with anti-corrosive grease. 3. Replace the damaged battery.

Appendix 1 Bolt Torque (Nm)

Grade	35、 45 HB101 ~ 207 5.6 ($\sigma_s=300\text{MPa}$)	16MnVB、 45 HB285 ~ 321 8.8 ($\sigma_s=640\text{MPa}$)	40Cr、 40MnB HRC35 ~ 40 10.9 ($\sigma_s=800\text{MPa}$)
M6	4 ~ 6.5	6 ~ 12	
M8	8 ~ 15	16 ~ 30	
M10	18 ~ 30	36 ~ 63	
M12	30 ~ 47	70 ~ 110	90 ~ 135
M16	85 ~ 127	180 ~ 210	220 ~ 300
M20	167 ~ 250	350 ~ 410	440 ~ 520
M24	300 ~ 460	580 ~ 650	820 ~ 900

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9



Foundation structure specification

Weight: 400kg;

Weight: 400kg: Height: 6m

二、Construction steps:

1. Dig a hole, diameter $\varnothing$ 7m, depth 2.12m;

2. Lashed the steel bar according to the drawing, and putting into the hole.

3. Set 5 turn foundation bolts on the template till to the bottom of screw thread and fixed by steel bar. Set 5 units M24 screw cap separately. Set the upper template on the foundation bolts and separately. Set the upper template on the foundation bolts and fastened by stud, and the size according to the left drawings and please note the horizontal degree of the every foundation bolts.

4. Put the fastened foundation bolts on the lashed steel bar, the other principle bar are layed stagger.

5. Check the location of each Foundation bolt and make sure all of them are Average distribution and consistent with a high level. After finished the pouring with C20 concrete, ensuring the foundation bolt above the concrete surface 50mm.

6. Concrete ratio: Cement : Stone : Sand : Water

C10 I(325=Cement)	2.45	1.64	0.5 (Weight ratio)
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C10 (425#Cement)	2.55	1.7	0.5 (Weight ratio)
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7. All of the steel materials should be derusting. Grade is St2, lay on the red lead (Anti-rust lacquer, alkylid or baskelic anti-rust lacquer) Precoating 2 times. Red alkylid magnet alkylid 2 times.

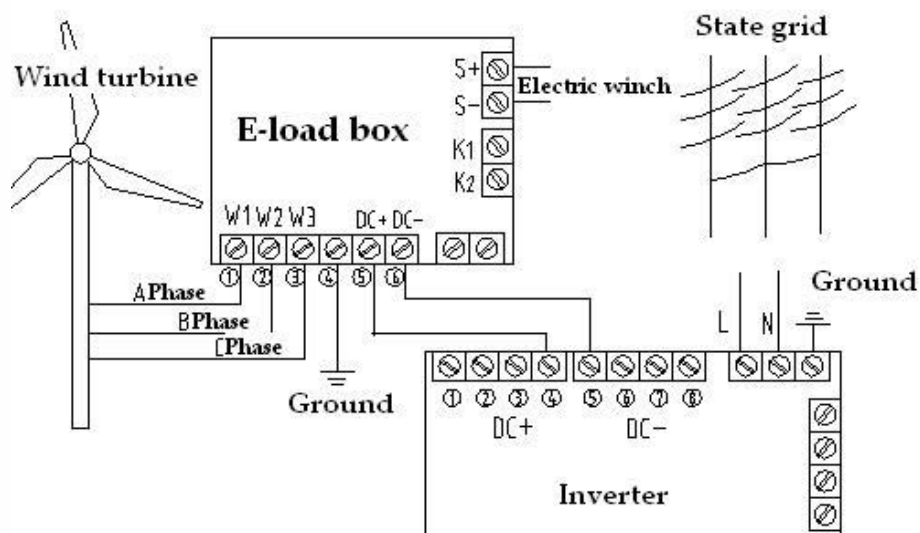
Fire protection treatment.

8. After installed the tower, concreting by C10 and pouring on the bottom of the pole. Avoiding to rust of bolt.

三、If there is any problems, it should be discussed with our engineers.

Appendix 3 On-Grid Wiring

On-grid wiring diagram



Appendix 4 Guide on Choosing the Electrical Cables

Distance between Generator & E-Load (D)	Cross Section Area (mm ²)	Maximum Current (Amp)	USA Gauge (AWG)	Total Length
D ≤ 1320 ft	≥6	24	8	3 X D
1320 ft < D ≤ 1,980 ft	≥10	40	5	
1,980 ft < D ≤ 2,640 ft	≥16	64	3	

Limited Warranty Information

A&C GREEN ENERGY 5 YEAR LIMITED WARRANTY

Talon wind turbines, electronics, and associated equipment manufactured by or for A&C Green Energy, Inc. are warranted against defects in design, material, and workmanship, under normal use for which intended, for five (5) years after delivery and as set forth below.

Warranty Fulfillment: A&C Green Energy agrees to be the liaison between the manufacturer of the products sold and the Buyer. The Buyer will be responsible for returning any defective product to A&C. A&C will be responsible for returning the warranty replacement to the Buyer. If it is determined that the item returned was damaged due to a non-warranted condition, Buyer will be responsible for any cost of repair and return shipping.

Proper Registration: Your registration must be completed within 30 calendar days of your dated receipt in order to validate this Limited Warranty. You may complete registration by filling out the online registration form online at <http://www.acgreenenergy.com/registerwarranty> or by completing the mail-in registration card as stated on the A&C Green Energy Registration Form and mailing it to:

A&C Green Energy
P.O. Box 941122
Plano, TX 75094

Upon your registration you shall receive a confirmation via email to inform you that your product has been properly registered. Both proper registration and a dated proof of purchase are required prior to obtaining warranty service.

Instructions: To obtain warranty service, simply call (800) 963-7973. When calling, please have all proof of purchase documentation and service material available including all serial and part numbers to help us quickly assist you.

Repair/Replacement Warranty: This Limited Warranty shall apply to any repair, replacement part or replacement product for the remainder of the original Limited Warranty period or for Five (5) years whichever is longer. Any defective parts or product replaced under this Limited Warranty will become the property of A&C Green Energy.

This limited warranty covers only the hardware components packaged with the Product. It does not cover technical assistance for hardware or software usage and it does not cover any software products whether or not contained in the Product; any such software is provided "AS IS" unless expressly provided for in any enclosed software Limited Warranty. Please refer to the End User License Agreements included with the product for your rights and obligations with respect to the software.

This Limited Warranty only covers product issues caused by defects in material or workmanship during ordinary consumer use. It does not cover product issues caused by

any other reason or use. This includes but is not limited to acts of God, misuse, limitations of technology, or modification of any part of the product. This Limited Warranty does not cover products sold "AS-IS" or "WITH ALL FAULTS" or consumables (such as fuses or batteries). This Limited Warranty is invalid if the factory-applied serial number has been altered or removed from the product.

This limited warranty does not cover:

- 1) Towers, equipment, materials, or supplies not manufactured by/for A&C Green Energy;
- 2) A&C Green Energy equipment that has been modified or altered without prior factory approval;
- 3) Damage or loss of function sustained during periods with wind speeds exceeding 50 m/s (110 mph)
- 4) Repairs performed by other than authorized A&C Green Energy service personnel;
- 5) Acts of God; or
- 6) Incidental or consequential damages.

Pursuant to this Limited Warranty, A&C Green Energy, will, at its option (1) repair the product using new or refurbished parts or (2) replace this product with a new or refurbished product. For the purposes of this Limited Warranty "refurbished" means a product or part that has been restored to its original specification. In the event of a defect the above represents your exclusive remedies.

LIMITATIONS ON DAMAGES: A&C GREEN ENERGY SHALL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES FOR BREACH OF ANY EXPRESSED OR IMPLIED WARRANTY ON THIS PRODUCT.

DURATION OF IMPLIED WARRANTIES: EXCEPT TO THE EXTENT PROHIBITED BY APPLICABLE LAW, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ON THIS PRODUCT IS LIMITED TO THE DURATION OF THIS WARRANTY.

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A&C Green Energy
PO Box 941122
Plano, TX 75094

Shipping Address:
A&C Green Energy
1108 Summit Ave., Ste 8
Plano, TX 75024

Talon Warranty Registration Card

Talon Model: Talon2

Serial Number: _____

Where was this unit purchased? _____

Purchase Date: _____

Purchaser Information:

Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone: _____ Email: _____

Keep this half for your personal records

Talon Model: Talon2

Serial Number: _____

Where was this unit purchased? _____

Purchase Date: _____

Purchaser Information:

Name: _____

Address: _____

City: _____ State: _____ Zip: _____

Phone: _____ Email: _____

Mail this half or fax to A&C Green Energy at fax# **972-516-0697**